WHAT IS CLAIMED IS:

1. A method for closed loop control in chemical mechanical polishing using an inline metrology station, comprising:

measuring a dielectric thickness in an array of a first wafer from a plurality of wafers at a metrology station;

determining at least one polishing parameter from the dielectric thickness in the array of the first wafer; and

polishing a subsequent wafer from the plurality of wafers using the polishing parameter.

2. The method of claim 1, further comprising:

measuring a dielectric thickness in a field of the first wafer.

3. The method of claim 2, wherein:

determining the at least one polishing parameter includes using the dielectric thickness in the field of the first wafer.

4. The method of claim 2, further comprising:

determining a measurement of erosion, where the measurement of erosion is a difference between the dielectric thickness in the field and the dielectric thickness in the array; and

wherein determining the at least one polishing parameter includes using the measurement of erosion.

5. The method of claim 1, wherein:

determining the at least one polishing parameter includes approximating an optimal solution under a plurality of constraints with reference to which a predicted metal feature thickness uniformity is maximized in a subsequent wafer from the plurality of wafers.

6. The method of claim 1, further comprising:

measuring a plurality of dielectric thicknesses at a plurality of arrays on the first

wafer, and determining the at least one polishing parameter from the plurality of dielectric thicknesses in the plurality of arrays.

7. The method of claim 1, further comprising:

passing the dielectric thickness measurement to a controller.

8. The method of claim 7, further comprising:

passing the polishing parameters to a chemical mechanical polishing apparatus.

9. The method of claim 1, further comprising:

measuring barrier layer residue thickness and determining the at least one polishing parameter from the dielectric thickness and the barrier layer residue thickness.

10. The method of claim 1, wherein:

determining the polishing parameter includes using the measurement of dielectric thickness in the array to approximate an optimal solution under a plurality of constraints with reference to which a predicted copper feature thickness uniformity is maximized and a difference between a predicted copper feature thickness and a target copper feature thickness is minimized.

11. The method of claim 1, wherein:

the polishing parameter includes at least a polishing time.

12. A method for closed loop control in chemical mechanical polishing using an inline metrology station, comprising:

measuring at a metrology station metal feature thicknesses at multiple points across a first wafer wherein the first wafer is one of a plurality of wafers;

calculating at least one polishing parameter using the measurements of the metal feature thicknesses of the first wafer that approximates an optimal solution under a plurality of constraints with reference to which a predicted metal feature thickness uniformity is maximized in a subsequent wafer from the plurality of wafers; and

polishing the subsequent wafer from the plurality of wafers using the at least one polishing parameter.

13. The method of claim 11, wherein:

measuring includes measuring with an acousto-optical metrology device.

14. The method of claim 11, wherein:

measuring includes measuring with a non-contact optical metrology device.

15. The method of claim 11, wherein:

measuring includes measuring the metal feature thicknesses in a plurality of dies at different radial positions from a center of the wafer.

16. The method of claim 11, wherein:

the plurality of constraints includes minimization of a predicted erosion in a subsequent wafer.

17. The method of claim 11, wherein:

measuring the metal feature thicknesses includes measuring copper feature thicknesses.

18. The method of claim 11, wherein:

the at least one polishing parameter includes a polishing time.

19. A method for closed loop control in chemical mechanical polishing using an inline metrology station, comprising:

polishing a first wafer from a plurality of wafers on a chemical mechanical polishing apparatus using a set of polishing parameters;

measuring the profile of the first polished wafer at a metrology station, the profile including at least a first measurement of dielectric thickness in a first array, a second measurement of dielectric thickness in a second array, a first measurement of dielectric

thickness in a first field, and a second measurement of dielectric thickness in a second field, where the first array is proximate to the first field and the second field is proximate to the second array;

determining a first erosion measurement and a second erosion measurement, where the first erosion measurement is a difference between the first dielectric thickness in the first field and the first dielectric thickness in the first array and the second erosion measurement is a difference between the second dielectric thickness in the second field and the second dielectric thickness in the second array;

calculating a new polishing parameter from the measurement of the profile of the first wafer using the first and second dielectric thicknesses in the first and second arrays and the first and second erosion measurements;

communicating the new polishing parameter to the chemical mechanical polishing apparatus; and

using the new polishing parameter to polish a subsequent wafer.

20. The method of claim 19, further comprising:

measuring barrier layer material residue overlying field dielectric material or array dielectric material;

wherein the plurality of constraints includes the chemical mechanical polishing apparatus completely removing the barrier layer material residue.

21. The method of claim 19, further comprising:

measuring metal residue overlying field dielectric material, array dielectric material or metal features;

wherein the plurality of constraints includes completely removing the residue.

22. A method for closed loop control in chemical mechanical polishing using an inline metrology station, comprising:

measuring a first dielectric thickness in a first array of a first wafer at a metrology station;

measuring a second dielectric thickness in a second array of the first wafer at the metrology station;

passing the first and second dielectric thicknesses from the metrology station to a controller;

determining in the controller at least one polishing parameter in the controller using the first and second dielectric thicknesses; and

polishing a subsequent wafer with the at least one polishing parameter.

23. A method for closed loop control in chemical mechanical polishing using an inline metrology station, comprising:

measuring metal residue and barrier material residue on a first wafer, where the metal residue and the barrier material residue are located on field dielectric material, array dielectric material and metal features;

calculating at least one polishing parameter using the metal residue and the barrier material residue measurements, where the at least one polishing parameter ensures complete removal of the metal residue and the barrier material residue in a second wafer; and

polishing the second wafer using the at least one polishing parameter.

24. A method for closed loop control in chemical mechanical polishing using an inline metrology station, comprising:

measuring at a metrology station metal feature thicknesses at multiple points across a first wafer wherein the first wafer is one of a plurality of wafers;

calculating at least one polishing parameter using the measurements of the metal feature thicknesses of the first wafer that approximates an optimal solution under a plurality of constraints with reference to which a difference between a predicted metal feature thickness and a target metal feature thickness is minimized; and

polishing a subsequent wafer from the plurality of wafers using the at least one polishing parameter.

26. A method for closed loop control in chemical mechanical polishing using an inline metrology station, comprising:

measuring a barrier layer residue thickness of a first substrate from a plurality of substrates at a metrology station;

determining at least one polishing parameter from the barrier layer residue thickness of the first substrate; and

polishing a subsequent substrate from the plurality of substrates using the polishing parameter.

27. The method of claim 26, wherein:

the polishing parameters are communicated to a polishing station of the chemical mechanical polishing apparatus.

28. The method of claim 26, further comprising:

measuring a plurality of barrier layer residue thicknesses on the first substrate, and determining the at least one polishing parameter from the plurality of barrier layer residue thicknesses.

29. A method for closed loop control in chemical mechanical polishing using an inline metrology station, comprising:

polishing a first substrate from a plurality of substrates on a chemical mechanical polishing apparatus using a set of polishing parameters;

measuring the profile of the first polished substrate at a metrology station, the profile including at least one measurement selected from the group consisting of a measurement of dielectric thickness in an array and a measurement of barrier layer residue thickness;

determining a new polishing parameter from the measurement of the profile of the first substrate;

communicating the new polishing parameter to the chemical mechanical polishing apparatus; and

using the new polishing parameter to polish a subsequent substrate.

30. The method in claim 29, wherein:

the new polishing parameter is calculated from the dielectric thickness measurement.

31. The method of claim 29, wherein:

the new polishing parameter is chosen to cause the polishing system to completely remove barrier layer material residue.

32. The method of claim 29, wherein:

the new polishing parameter is chosen to cause the polishing system to provide uniform copper feature thickness.

33. The method of claim 29, wherein:

the new polishing parameter is chosen to cause uniform polishing from one substrate in the plurality of substrates to another substrate in the plurality of substrates.

34. The method of claim 29, wherein:

the profile measurement includes residue thickness.

35. A method for closed loop control in chemical mechanical polishing using an inline metrology station, comprising:

measuring a metal feature thickness in an array of a first substrate from a plurality of substrates at a metrology station;

determining at least one polishing parameter from the metal feature thickness in the array of the first substrate; and

polishing a subsequent substrate from the plurality of substrates using the polishing parameter.